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*Centralized Lubrication**

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The Farval Corp., Cleveland, Ohio

(Continued from September Issue)

The mills and metal working plants with broad experience with all types of bearings and methods of lubrication have found it better to be able to lubricate all bearings on the bridge or trolley from one place and establish regular definite schedules for this job. They find that this practice insures that all bearings are lubricated regardless of their type or location and that they do not encounter maintenance delays, which in many cases have been reduced by as much as 50% through the installation of a centralized system.

We know of one case where roller bearing cranes were running on the same runway, some of which were equipped with centralized systems while others were not. After six months operation, the cranes without centralized lubrication were involved in delays for replacement of bearings. In one instance, the bearing replacement amounted to some $800 on two 30 ton cranes. There was nothing wrong with those bearings except that no one had time, or took the time, to go around and put fresh lubricant into them at regular intervals.

One of the crane builders recently made an observation that is both interesting and very much to the point. After they had put centralized lubrication on several cranes they were building, the head of this company stated he felt most crane users were engineering their crane specifications to the "Nth" degree electrically, but were overlooking the fact that they needed a centralized system to provide adequate lubrication to keep them running.

We might add that centralized lubrication is equally important to the continued operation of the old cranes and that a lot of people who provide lubrication for their new cranes overlook the value of it for the cranes they have in operation.

Courtesy Lubrication Engineering

Anti-Friction Bearings

Oil is generally considered to be the ideal lubricant for ball bearings, but it must be supplied in just the right amount and not too much or too little. If too much oil is supplied, heat is generated through churning and further, oil is difficult to keep from leaking out of the housing. Oil also presents the problem of leaving the bearings dry and exposed to rust when idle.

Therefore, while oil may be an ideal lubricant, it is very difficult to get a practical method of application without involving considerable expense.

For these reasons, most of the bearing manufacturers recommend the use of a soft, high-grade grease because it does not work out of the housing, will tend to seal the space between shaft and bearing, and also because at the higher speeds the rise in bearing temperature will be less than with oil.

Now some people feel that because a crane or any production machine is equipped with anti-friction bearings they need only be lubricated once a month or even once in two months. Who is going to remember to do this job, say every six weeks? And—when lubricating by hand, you have no control over how much or how little a man may put into a bearing. Usually it is too much because he wants to be relieved of the responsibility for not having given the bearings enough.

Anybody can lubricate a plain sleeve type bearing but an anti-friction bearing must not be overlubricated and it must be given clean lubricant, all of which is assured through the closed centralized system which will deliver an accurately controlled amount to each bearing. The advent of the anti-friction bearing, therefore, has not eliminated the need for lubrication nor simplified the method of lubrication, but it has put it on a much more scientific basis.

Presses and Forging Machines

One of the earliest and probably the most generally accepted applications for centralized lubricating systems is on metal stamping presses as illustrated in Figure No. 15. Some installations were made as early as 1926 and a few years later it was not uncommon to find all presses in a department or even in an entire plant, equipped with centralized lubrication throughout. In 1929, our company made a complete plant installation consisting of 240 systems to serve between 5000 and 6000 bearings.

The large double crank and double action toggle presses offer the greatest opportunity for the maximum savings in labor, lubricant, and repairs, but the small presses can also show substantial economies through the use of centralized lubrication. Any piece of mechanical equipment that is down for bearing repair or replacement means lost production and sometimes the failure of but one bearing on one machine may shut down an entire department. Most of the press applications have consisted of the simple manually operated system.

The heavy duty forging machine shown in Figure 16 is equipped with an individual full automatic centralized system of oil lubrication, to provide the high pressure delivery of a measured charge to all bearings and slides at frequent and regular intervals.

This application is typical of those machines whose design, work load, and the conditions under which they must operate, require the frequent renewal of lubricant to insure continuous production. With the scale formed by the hot metal, header and die slides need the flushing action obtained from the frequent delivery of lubricant.

FIGURE 15

The large diameter heavily loaded main eccentric bearing also requires regular renewal of lubricant especially in view of its somewhat narrow face width.

In the past many forging machines were lubricated from a central reservoir with gravity feed to the bearings and slides, but in the past few years more and more of the machinery builders are changing over to the positive pressure delivery provided by a centralized system.

MACHINE TOOLS

While a centralized system requires that lubricant be supplied at but one point—it is important to prevent the entry of dirt or foreign matter at this point, in order to provide delivery of clean lubricant from the barrel to the bearings. Figure 17 illustrates the convenient method employed to fill the individual pumping units on each machine, by means of the portable grease-pak with its length of flexible hose and quick fill connection.

The grease-pak is filled in the oil storage room from a barrel transfer pump and thus the lubricant is transferred from the original drum to the central system and finally to the bearings, without exposure to the air. In addition the pumping units of the central system are generally equipped with a filter or screen at the inlet fill connection to guard against carelessness on the part of the oiler.

In adopting centralized lubrication to high production machinery, the builder must provide in his design, for a built-in job that will be fully protected against accidental damage, in the normal operation or use of the machine. Figure 18 is an excellent example of this type of installation, in that in spite of the large number of bearings being served, the builder has made a neat, compact job of it, keeping the tubing in protected locations and yet leaving the lubricating systems fully accessible for any adjustment or attention required.

This special Horizontal Drum Type Indexing Production Machine was employed for taper reaming nozzle holes in 5" Rocket End Plates, at the rate of 100 pieces per hour. The system on the 34 Spindle Auxiliary Head and Travelling Carriage at the right, delivers a measured charge of oil to 36 points of lubrication including the bushings and the bearings and all moving parts.

Figure 19 shows a close-up view of the special sliding bushing plate with all bushings being served by a separate central oil system. The reader will note how the tubing leading to the many bushings has been kept out of the way of the tools and that it is securely and adequately clamped in place.

Another example of how a change in the design has made it possible to give complete lubrication of all points from a central system is illustrated in Figure 20. The upper view shows the four conventional nipples or fittings employed to lubricate the cylinder walls of air actuated plungers. Without a change in design, these points could not be served by a central system because the cylinder rotates and flexible connections would be impractical. From the lower view you will note that by lengthening the air channel through the piston rod and by means of cross drilled passages, combined with suitable grooving, all surfaces are lubricated through the oil that is injected into the air stream by the central system. A special atomizer quill through which the oil is fed is inserted in the air supply at the right.

ROLLING MILLS

As mentioned earlier in this paper, centralized lubrication will provide outstanding savings when applied to old existing equipment and the results obtained on the 3-Hi Plate Mill shown in Figure 21 gives a good indication of what may be accomplished.

On the older equipment shutdowns for bearing repair or replacement following a production run are accepted as standard practice, and frequently the bearing and lubricant costs, power consumption, mill delays, etc., are considered to be a minimum normal figure. It is on this old equipment, however, where direct comparisons can be obtained and where perhaps the greatest opportunity for savings is offered.

On the mill shown in Figure 21, a set of top roll brasses had an average life of 20,000 tons before centralized lubrication was installed. After its installation, the life of these bearings was increased 25 times. The former average life of a set of bottom roll bearings was about 40,000 tons and centralized lubrication has increased this figure to 180,000 tons. The shorter life of the bottom bearings can be charged to the presence of scale, although you will note the life has been increased

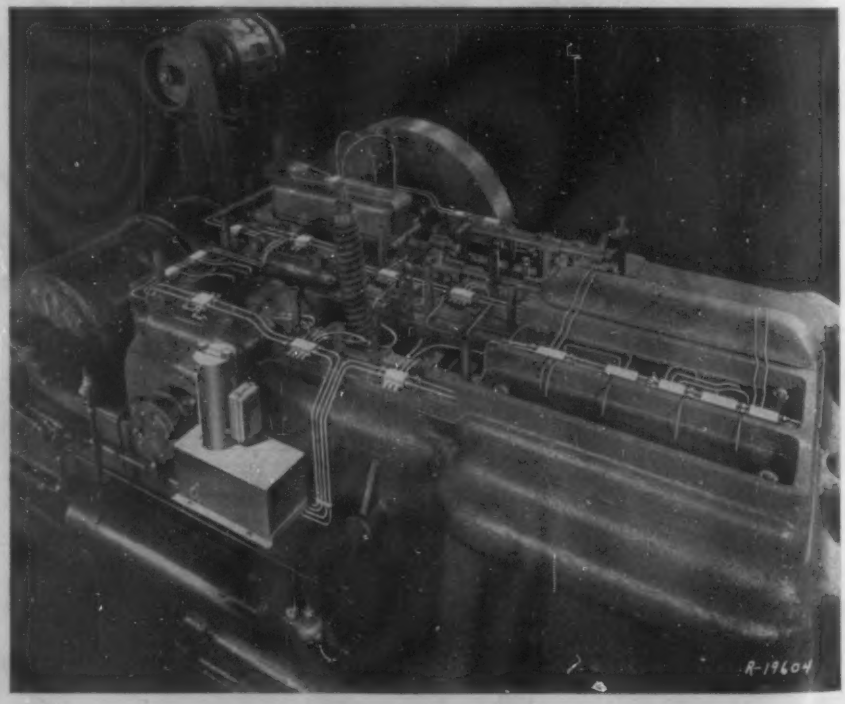

FIGURE 16

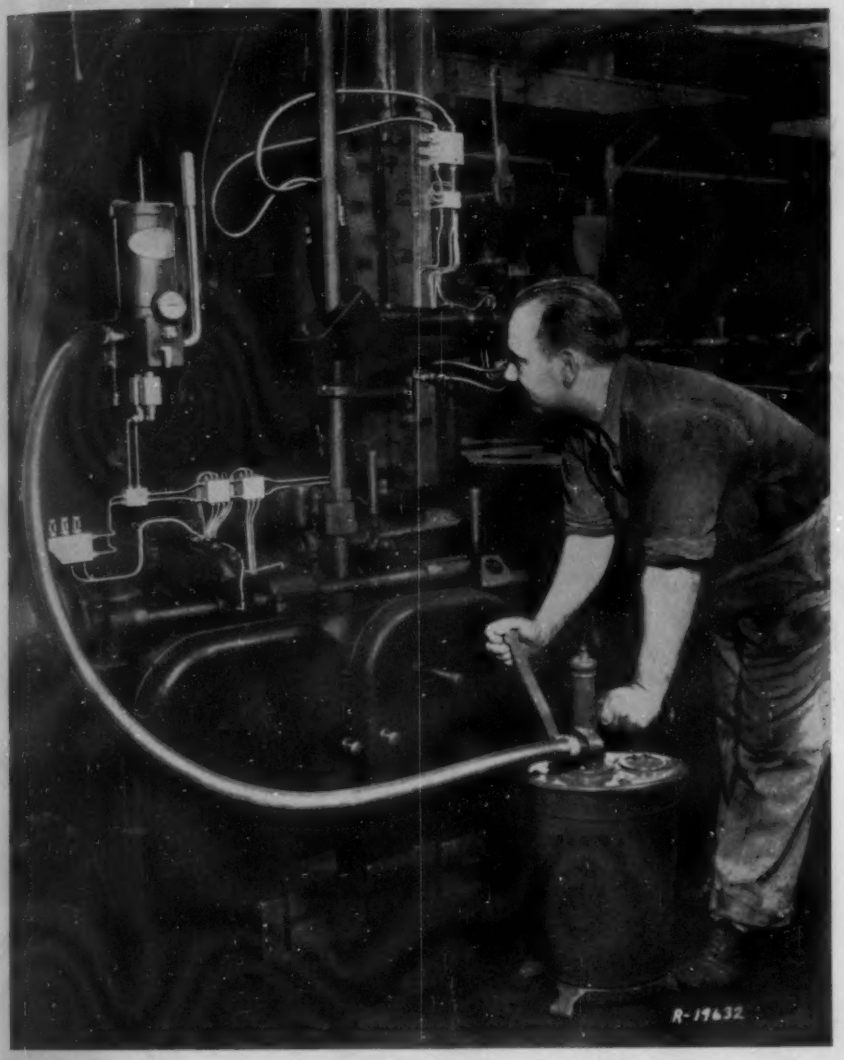

FIGURE 17

ome 4½ times its former average. These esults were obtained using the same bear- ng materials and design, and with the same lubricant.

A set of four brasses weighs approximately 2400 pounds and the increased life gives a saving of more than 190 tons of bearing metal for the tonnage rolled. This saving is conservatively estimated at $15,000 per year.

In the past, hot and worn necks resulted in bad gauge variations, curved plates, and plates running into the necks. By eliminating worn necks and excessive bearing wear, centralized lubrication not alone cut down mill delays, but also cut the rejections due to these causes from the former average of 1½% down to .5%. On the basis of rolling 300 tons per turn, a saving of 1% amounts to approximately nine tons per day, which in turn means a saving at the $60.00 per ton selling price, over $500.00 per day. These results were obtained from an original investment in the lubricating systems of less than $3,000.00.

RUBBER MILLS

Centralized lubrication on rubber mill roll neck bearings also gives substantial savings in labor, lubricant, reduced maintenance and increased output.

At one plant where 40 mills or more were equipped with centralized lubrication, they formerly employed eight oilers and after the installation needed but two. This resulted in reducing lubricant costs from $1400.00 to $400.00 per month. In addition, their former lubricant costs for one 60" mill using sight feed oil cups, was reduced from 24c for each eight-hour shift to 2c per mill per shift. A saving of 22c per shift or 66c per day per mill gave a total saving for all mills of $28.00 per day.

Notwithstanding the large savings made in labor and lubricant, this user states that the elimination of the former mill delays

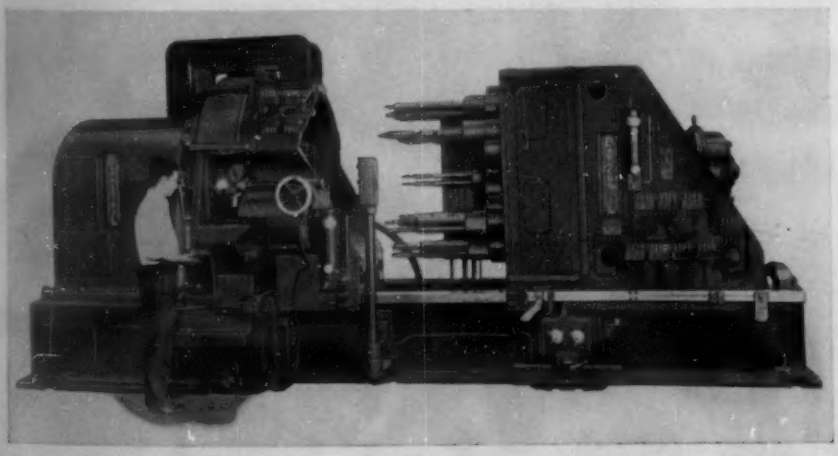

FIGURE 18

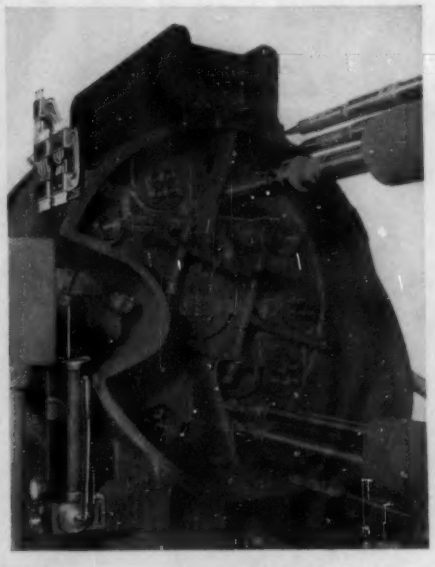

FIGURE 19

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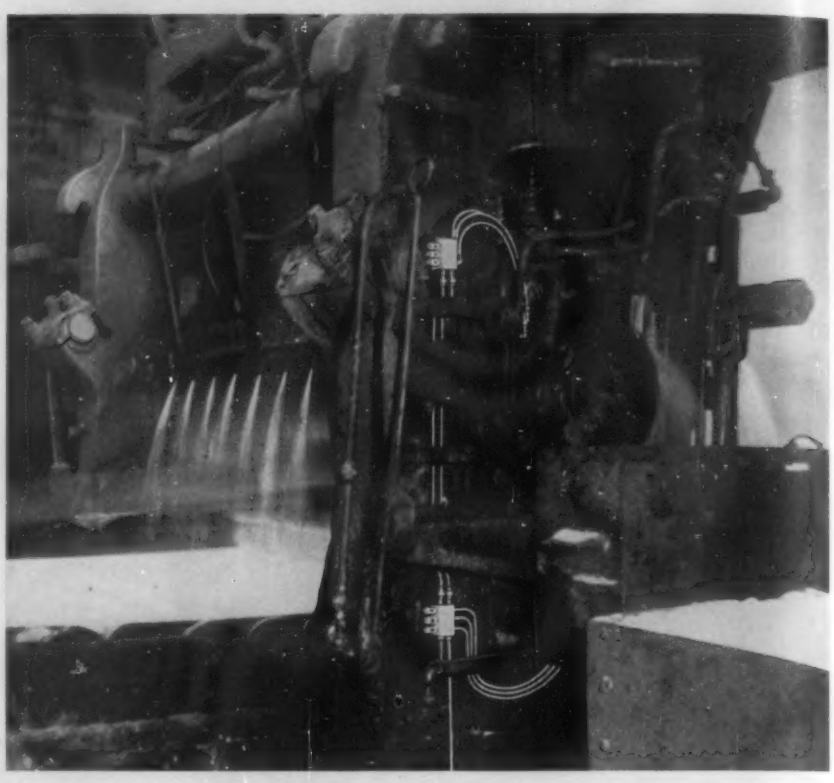

FIGURE 21

due to hot bearings has given them a greater saving through increased output than all the other economies combined. These results were obtained from an original investment in the lubricating systems of approximately $7,500.

First installations in the rubber industry were made some ten or twelve years ago and today centralized lubrication is being used on Refiners, Curing Presses, Banbury Mixers, Hose Wrapping Machines, Latex Machines, Conveyors, Rim Rollers and Expanders, etc. Practically all of the new plants that have been built in the past few years are equipped with centralized lubrication throughout. At one plant alone more than 200 rubber mills are being served by modern centralized systems of lubrication.

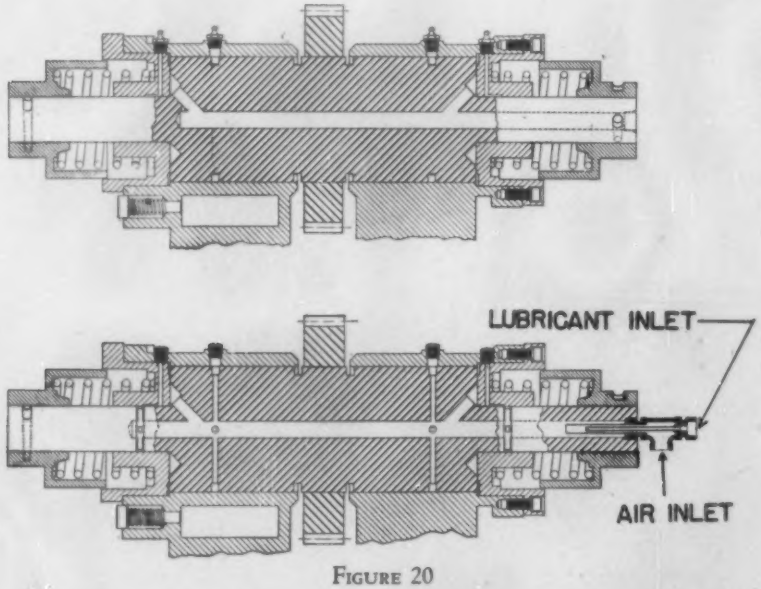

FIGURE 20

Similar economies to those outlined above could be reported for many other major industries such as coal, glass, cement, refractories, chemical, textile, and food.

CONCLUSION

In normal times, experience has proven that it is pretty hard to depend on the human element to get around to the many bearings often enough to maintain a protective film of lubricant at all times. Under present conditions, centralized lubrication would seem to be the only hope of keeping a lot of bearings properly lubricated and keeping a lot of machines in continuous production. Certainly in the competitive, price-ceiling days that lie ahead, there will be no time for minor delays that add up to major shutdowns. Above all, there will be no time to lubricate by hand, or to repair the lack of lubrication.

The decision as to whether to install centralized lubrication on all equipment will depend on one of three alternatives.

(1) Hire enough oilers to get around often enough to keep all bearings properly lubricated at all times.

(2) If money isn't spent for oilers, it will be spent in maintenance and repairs and lost production.

(3) Spend the money once for a centralized system and it will continue to earn year after year.

Correct lubrication of industrial bearings requires careful consideration of each of the following factors:

(a) Selection of the proper bearing materials.

(b) Providing sufficient bearing area to support the load.

(c) Designing grooves correctly to insure proper distribution of lubricant.

(d) Protection with adequate seals where necessary.

(e) Selection of the proper kind and quality of lubricant for the bearing design and operating conditions.

(f) Providing a dependable means for the proper application of the right kind of lubricant at regular intervals.

These elements require the combined talents of the designer, the machinery builder, the lubricating engineer, the bearing manufacturer, the lubricating system manufacturer, and the lubricant supplier. It is to be hoped that the American Society of Lubrication Engineers may become the vehicle through which the full cooperation of all of them may be attained.

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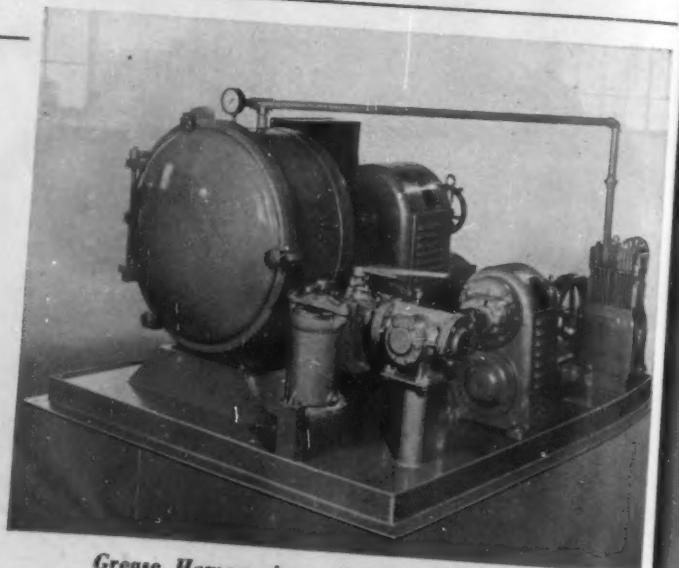

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